

# *SÃO PAIO (LABRUGE, NW PORTUGAL), AN EMBRYO TO A COASTAL GEOPARK*

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**Keywords:** *São Paio, Labruge, geosite, archaeosite, Centro Interpretativo do Castro de São Paio, Geopark*

São Paio (W 08° 43' 46,978", N 41° 16' 49,165", WGS84) is simultaneously a geosite, a geomorphosite, an archaeosite and a religious cult site. Its core has hardly 2 ha in area but holds outstanding relevance in scientific, cultural, educational, environmental and socio-economic terms. It is included in a Protected Landscape Area (Paisagem Protegida Regional do Litoral de Vila do Conde e Reserva Ornitológica de Mindelo) that was recently defined with a focus mostly in environmental coastal assets based on relevant supra-local landscape, geology, fauna, flora, cultural and conservation values and based in sustainable activities, with nature tourism having a bold place. São Paio is here a proposed focal point for the future evaluation of the feasibility of a coastal geopark within the vast Metropolitan Area of Porto.

São Paio is located in northern Portugal, 15.8 km north from the Douro river mouth and 6.7 km south from the mouth of the river Ave. It consists in an isolated rocky cliff on this stretch of low north-western Portuguese coast with its highest point ca. 23 m amsl over the often rough Atlantic Ocean. Its dominion over the coastal landscape is highlighted by Blue Flag sandy beaches of Labruge to the south, and Moreiró to the north. It takes position in front of an extensive low slope polycyclic littoral platform carved at least since late Cenozoic in a crystalline basement incised by small rivers, leaving remnants of a thin sedimentary cover up to the Holocene.

São Paio has probably the northernmost onshore outcrop of a segment of an old polymetamorphic continental crust integrated in the Ossa-Morena Zone of the Iberian Massif. The contact to the east is shown here and made through a major tectonic suture with Central Iberian Zone variscan granites and metamorphic rocks from late Proterozoic-Paleozoic. Swarms of deformed and undeformed felsic veins crisscross gneiss, migmatite and granite outcrops. Anorogenic basic dykes and faults affecting them probably relate to the opening of the Atlantic Ocean during Mesozoic or represent later deformation phases, some of them with seismogenic character.

Following exhumation, deep geology controlled quaternary geology and geomorphology, not only providing support and materials, but also contributing to its evolution in interplay with coastal processes, climate change and other external processes. In fact, tectonic features at São Paio emphatically constrain geomorphic features like linear cliffs. Neotectonic activity has been proposed as a cause for the unique and peculiar sequence in altimetry of several fossil notches typical of hard rock shores in mesotidal high energy environment. We find here in association with infrequent coeval marine deposits to be dated soon, suggesting standing water levels during the last interglacial period and its tectonic dislocation. Nearby, a small outcrop with a last interglacial marine layer, superposed by a solifluxe formation and aeolian sands TL dated of ca 84.k years BP demonstrates the complex evolution of the environmental conditions and climatic changes during the last 125.000 years. São Paio alone holds rock types of varied origin, evidence of folding, metamorphism, magmatism, and records a rich sequence of shear zones and ductile to fragile fractures, all demonstrating a vast sequence of geological events often discerning clear stratigraphic relations infrequent elsewhere, all with high earth science and educational relevance, whose study continues.

An archaeosite of international importance was discovered here in the decade of 1950. It is the only “*castro marítimo*” in Portuguese territory that is also the oldest and the southernmost of a series of 1st Iron Age walled settlements built in NW and N of Iberian Peninsula with round stone thatched houses and taking advantage from their hanging position over the ocean. Proto-historic peoples probably used a small beach protected by rock walls as a port. Rock engravings were inscribed in São Paio rock outcrops. Scattered around, several much older pre-historic stone tools were found. Much of this is yet to be studied by modern archaeological science. The outstanding importance of this rich prehistoric site and of the material remains set up the focal point for a long time project recently brought to light by the municipality of Vila do Conde: an onsite interpretation and museological centre aimed to demonstrate and support research and educational activities involving the Castro de São Paio, considering Geology, Geomorphology, Biology and Archaeology.

Along the coastal outcrops runs a centuries old footpath variant of the Way of St. James (“*Caminho de Santiago*”) leading to Santiago de Compostela, allowing pilgrims to pay a visit or give a prayer there at the old chapel of São Paio, also cherished by locals and foreigners.

It is clear to the authors a sustained crescendo in interest and effective actions taken by the regional authorities, the municipality and local authorities, local and regional cultural and environmental ONG, a broad scientific community, the local population and the economic players. However they are not yet coordinated. This first public proposal is hoped to raise a common conscience needed to integrate a concept and multiply efforts, plans, actions and success, setting his future based in geotourism as a littoral geopark.

With such assets, why not consider São Paio an embryo to a Geopark that values them all?



Fig.1. Perspective synthetic view of São Paio, Labruge, Vila do Conde, Portugal (ca 300x200m, North to the left).



Fig.2. Left: fossil notch 9 mamsl. Right: marine sediments fossilizing the same notch.